

Technology Opportunity

Early Diagnosis of Eye Diseases

The National Aeronautics and Space Administration (NASA) seeks to transfer a NASA-developed new technology for early detection of various eye diseases. This technology is currently being used in animal tests. An interagency agreement between NASA and the National Eye Institute (NEI) of the National Institutes of Health (NIH) is being set up to transfer the technology to eye care professionals in a timely manner.

Potential Commercial Uses

- Early detection of cataracts
- Early detection of vitreous diseases (e.g., diabetic retinopathy and asteroid hyalosis)
- Monitoring blood sugar and cholesterol levels

Benefits

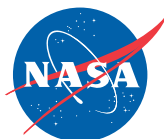
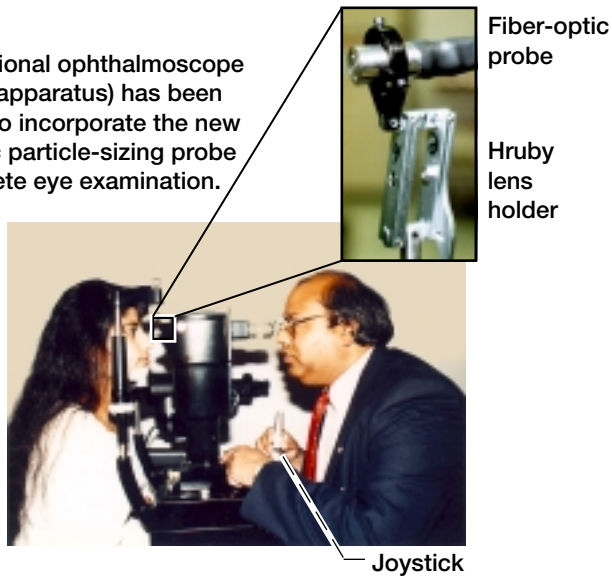
- Compact and rugged, with no optical alignment necessary
- Accurate and reliable

- Use separately or by attaching to a conventional ophthalmoscope (slit-lamp apparatus) commonly used in clinical eye examinations
- Safe to use—extremely low laser radiation, very short test duration, and no physical contact with the eye (noninvasive)
- Incorporates an optional video system for visual monitoring of the eye
- Can be used in screening possible anticataract drugs

The Technology

Cataracts remain the major cause of blindness worldwide, affecting about 50 million people each year. It is estimated that over \$5 billion will be spent this year in treating cataract patients in the United States alone. There is no medical treatment to prevent or halt the progression of a cataract; nor is there any way to reverse a cataract once it has formed. The only known treatment is surgery. However, a

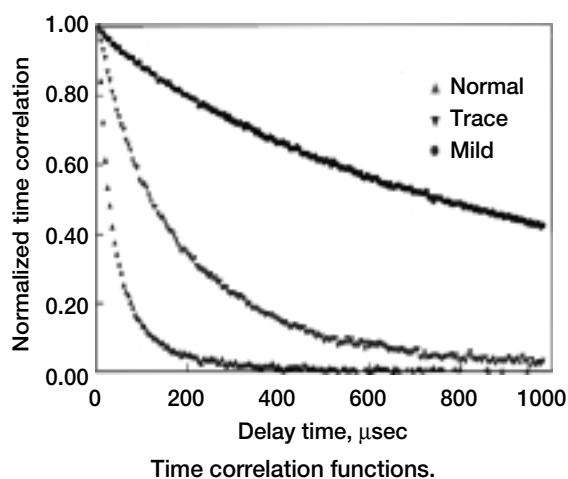
A conventional ophthalmoscope (slit-lamp apparatus) has been modified to incorporate the new fiber-optic particle-sizing probe for complete eye examination.



National Aeronautics and
Space Administration
Glenn Research Center



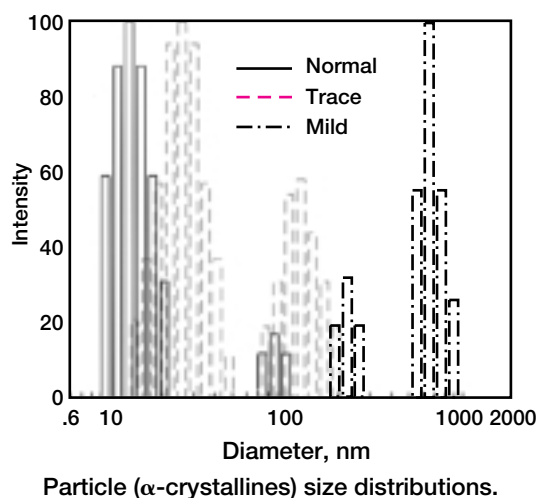
CATARACT DEVELOPMENT IN ANIMALS (PHILLY MICE)



nonsurgical treatment could be possible if we understood how a cataract forms and what makes it grow. In order to find a medical treatment for cataracts, first, we must be able to detect a growing cataract in its early stage of formation. Such detection will be useful in patient monitoring and in developing and testing possible anticataract drugs or diet therapies.

A new fiber-optic probe based on dynamic light scattering (DLS), has been developed for early detection of various eye diseases. A low-power laser beam is launched into an eye, and the backscattered light is collected and processed to determine the average size and size distribution of submicroscopic particles in the eye—such as cholesterol deposits in the anterior chamber, protein crystallines in the lens, and hyaluronon acid molecules and collagen fibers in the vitreous humor. By monitoring the change in the particle size, medical personnel could detect various eye diseases—such as cataracts, diabetic retinopathy, and asteroid hyalosis—in their early stages. Blood sugar and cholesterol levels also could be monitored by such eye measurements without extracting blood.

The probe is compact, rugged, and easy to use. There is no physical contact to the eye, the laser radiation level is extremely low, and the measurement duration is very short, ensuring safety. The probe can be easily attached to an existing ophthalmoscope by means of a Hruby lens holder. An optional video imaging system can be added to provide visual monitoring of the eye as the measurements are underway. The probe has been tested on live animals



as well as on excised cadaver eyes. Currently, in collaboration with the National Eye Institute (NEI) of the National Institutes of Health (NIH), experiments are being conducted on congenital and drug-induced cataracts in Philly mice and transgenic mice. In addition, clinical trials on human patients are being planned.

Options for Commercialization

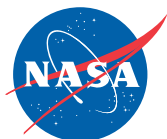
Technology for early detection of various eye diseases has been developed at NASA Glenn, and a patent application has been filed. Glenn researchers are seeking industry partners for development and commercialization.

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Key Words

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